Stewie Lab:

- Hypothesis should just be one variable.
- Reason for the cost analysis was to determine the lowest cost per ear of corn
- We really cared about the cost per ear of corn

Density:

- Example:

  1 kg of feathers

  1 kg of rocks

  Volume → how much space something takes up

  Mass → amount of matter in an object

  Which has more volume?

  Feathers

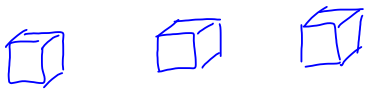
  Which one has more more mass? Neither → they are the same!

- Definition of density:

  Mass divided by unit volume

- Density is a measure of how tightly packed atoms are in the material.

- Another example:



$V = 1\ cm^3$ $V = 1\ cm^3$ $V = 1\ cm^3$

Wood Water Iron

$m = 0.5\ g$ $m = 1\ g$ $m = 8\ g$

∴ Iron has the highest density

$$\text{density} = \frac{\text{mass}}{\text{Volume}} = \frac{8\ g}{1\ cm^3} = 8\ \frac{g}{cm^3}$$

- Different objects have different densities.

SUBSTANCE	DENSITY (G/CM^3)
AIR	0.0013
WOOD (OAK)	0.85
WATER	1.00
ICE	0.93
ALUMINUM	2.7
LEAD	11.3
GOLD	19.3
ETHANOL	0.94
METHANOL	0.79

- Less dense substances float on more dense substances.

Least Dense: Vegetable oil
0.75 g/cm³

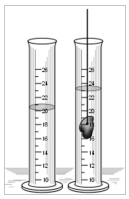
Most Dense: Honey
1.36 g/cm³

- Gases: 0.00 ___ g/cm³
- Liquids: ~0.5 to 1. ___ g/cm³
- Solids: ~0.2 to ~100 g/cm³

- Determining Density:
  - Measure mass
    - triple beam balance
    - electronic scale
  - Measure volume
    - use a ruler

      $V = (\text{length})(\text{width})(\text{height})$

      for "standard" objects



    - graduated cylinder

      for "non-standard" objects

Standard → uniform material throughout, rectangular prism shape

- submerge object in water, measure water displacement

displacement = highest measurement − lowest measurement

- Calculate

$$D = \frac{m}{V}$$

(D: uppercase; m: lowercase; V: uppercase)

- Units: mass: grams

  volume: mL or cm^3 (these are equivalent)

  density: $\frac{g}{mL}$ or $\frac{g}{cm^3}$

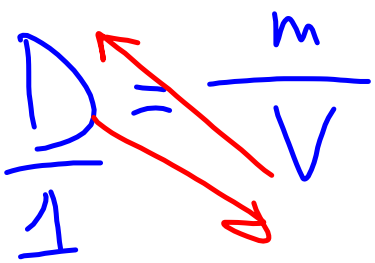
Osmium is a very dense metal. What is its density in g/cm³ if 50.00 g of the metal occupies a volume of 2.22cm³?

$D = \frac{m}{V}$ ← ALWAYS write your starting equation, in variables.

$= \frac{50.00\ g}{2.22\ cm^3}$

$= 22.5\ g/cm^3$

If blood has a density of 1.05 g/mL, how many milliliters of blood are donated if 575 g of blood are given?



$D = 1.05\ g/mL$

$m = 575\ g$

$V = ?$

$$V = \frac{m}{D}$$

$$= \frac{575\ g}{1.05\ g/mL}$$

$$= 547.6\ mL$$

What is the density (g/cm^3) of 48 g of a metal if the metal raises the level of water in a graduated cylinder from 25 mL to 33 mL?

$D = ?$

$m = 48\ g$

$V = 33\ mL - 25\ mL = 8\ mL$

$$D = \frac{m}{V}$$

$$= \frac{48\ g}{8\ mL}$$

$$= 6\ g/mL$$